

WHAT IS CLAIMED IS:

1 1. A system for feeding comminuted cellulosic fibrous material in a liquid slurry to at
2 least one digester, comprising:
3 a device which slurries comminuted cellulosic fibrous material in liquid;
4 a first pump for pumping slurry from said slurrying device to at least one digester;
5 a second pump for supplying make-up liquid to the digester;
6 a source of liquid for slurrying the comminuted cellulosic fibrous material; and
7 a single tank which performs both the function of controlling the level of liquid in said
8 slurrying device, and the function of storing and supplying liquid in association with said
9 source to said second pump, so that said first pump is properly and effectively substantially
10 continuously supplied with liquid slurry, and said second pump with liquid.

1 2. A system as recited in claim 1 wherein said slurrying device includes a
2 substantially vertical conduit, and wherein said single tank substantially surrounds said
3 conduit and is in liquid communication therewith.

1 3. A system as recited in claim 2 wherein said first pump is operatively connected
2 to said substantially vertical conduit by a connecting conduit or transition; and wherein
3 there is a gap between said substantially vertical conduit and said connecting conduit or
4 transition; and wherein said single tank substantially surrounds said gap.

1 4. A system as recited in claim 3 wherein said gap has a substantially vertical
2 dimension of between about 3-48 inches, and wherein a screen or strainer is provided at
3 said gap to minimize the amount of comminuted cellulosic fibrous material passing into
4 said single tank through said gap.

1 5. A system as recited in claim 4 wherein said substantially vertical conduit is in
2 further liquid communication with said single tank by at least one opening in said conduit
3 vertically above and spaced from said gap.

1 6. A system as recited in claim 2 wherein said single tank is substantially concentric
2 with said substantially vertical conduit.

1 7. A system as recited in claim 2 wherein said single tank comprises a substantially
2 right cylindrical upper portion and a substantially right circular cone frustum lower portion.

1 8. A system as recited in claim 2 wherein said single tank has a substantially right
2 cylinder shape.

1 9. A system as recited in claim 1 wherein said single tank is spaced and distinct
2 from said slurring device.

1 10. A system as recited in claim 1 further comprising a high pressure feeder
2 connected to said first pump and having a low pressure outlet; an undesirable solids
3 separator connected to said low pressure outlet; an in-line drainer connected to said
4 separator; said in-line drainer having a first outlet line connected to said second pump, and
5 a second outlet line connected to said slurring device; and an automatically controlled
6 flow-controlling valve in said second outlet line which controls the proportion of liquid from
7 said in-line drainer flowing in said first outlet line compared to said second outlet line.

1 11. A system as recited in claim 2 further comprising a high pressure feeder
2 connected to said first pump and having a low pressure outlet; an undesirable solids
3 separator connected to said low pressure outlet; an in-line drainer connected to said
4 separator; said in-line drainer having a first outlet line connected to said second pump, and
5 a second outlet line connected to said slurring device; and an automatically controlled
6 flow-controlling valve in said second outlet line which controls the proportion of liquid from
7 said in-line drainer flowing in said first outlet line compared to said second outlet line.

1 12. A system as recited in claim 11 wherein said second outlet line, downstream of
2 said valve, is substantially directly connected to both said substantially vertical conduit
3 above said single tank and to said single tank.

1 ³⁰¹ 13. A comminuted cellulosic fibrous material treatment system, comprising: a
2 digester having a comminuted cellulose material inlet at the top thereof;
3 a first vessel, at a first pressure, containing comminuted cellulosic fibrous material,
4 and having a top, a bottom, and an outlet adjacent said bottom;
5 a conduit having an inlet communicating with the outlet of said first vessel, and an
6 outlet;
7 a second vessel, having a width dimension greater than said conduit, for receiving
8 the cellulosic material from said conduit and having a level of liquid therein; and
9 a slurry pump having an inlet for receiving material from the second vessel and an
10 outlet operatively connected to the inlet of said digester.

11 14. A system as recited in claim 13 further comprising a metering device between
12 and connecting said first vessel and said conduit inlet.

13 15. A system as recited in claim 13 further comprising a pressure-isolation device
14 between and connecting said first vessel and said conduit inlet.

15 16. A system as recited in claim 13 wherein said first vessel comprises a device
16 which steams comminuted cellulosic fibrous material.

17 17. A system as recited in claim 13 wherein said second vessel comprises a tank
18 having a substantially right cylinder upper portion; and a substantially right circular cone
19 frustum lower portion, said tank and said conduit being substantially concentric and in
20 liquid communication with each other.

1 ³⁰² 18. A system as recited in claim 17 wherein said slurry pump is operatively
2 connected to said conduit by a connecting conduit or transition; and wherein there is a gap
3 between said conduit and said connecting conduit or transition; and wherein said tank
4 substantially surrounds said gap.

1 19. A system as recited in claim 18 wherein said gap has a substantially vertical
2 dimension of between about 3-48 inches, and wherein a screen or strainer is provided at

3 said gap to minimize the amount of comminuted cellulosic fibrous material passing into
4 said single tank through said gap.

1 20. A system as recited in claim 19 wherein said substantially vertical conduit is in
2 further liquid communication with said single tank by at least one opening in said conduit
3 vertically above and spaced from said gap.

1 ~~bbB3~~ 21. A system as recited in claim 13 wherein said second vessel comprises a tank,
2 and wherein said slurry pump is operatively connected to said conduit by a connecting
3 conduit or transition; and wherein there is a gap between said conduit and said connecting
4 conduit or transition; and wherein said tank substantially surrounds said gap.

22. A system as recited in claim 21 wherein said gap is between about 1-2 feet and
substantially open and provides substantially free communication between said tank and
said conduit.

1 ~~bbB4~~ 23. A system as recited in claim 13 wherein said second vessel comprises a tank in
2 liquid communication with and substantially surrounding said conduit, said conduit having a
3 screen surface substantially where surrounded by said tank.

24. A method of feeding a slurry of comminuted cellulosic fibrous material in liquid
2 to a digester having an inlet utilizing a pretreatment vessel, and a slurry pump having an
3 inlet, comprising:
4 (a) pretreating the comminuted cellulosic fibrous material in the pretreatment vessel;
5 (b) passing the pretreated material from the pretreatment vessel into a first conduit;
6 (c) discharging the material from the first conduit into a tank having a width
7 dimension greater than the first conduit;
8 (d) entraining the comminuted cellulosic fibrous material in liquid in the tank to form
9 a slurry;
10 (e) feeding the slurry to the inlet of the slurry pump; and
11 (f) transporting the slurry to the inlet of the digester.

1 25. A method as recited in claim 24 utilizing a high-pressure transfer device having
2 a low-pressure inlet and outlet and a high pressure inlet and outlet, said method further
3 comprising, between (e) and (f), (g) pumping the slurry with the slurry pump to the low-
4 pressure inlet of the high-pressure feeder, and (h) discharging the slurry from the high-
5 pressure outlet of the high-pressure feeder.

1 26. A method as recited in claim 24 further comprising between (c) and (d), (l)
2 metering the flow of comminuted cellulosic fibrous material from the pretreatment vessel.

1 27. A method as recited in claim 25 further comprising passing the liquid from the
2 low pressure outlet through an in-line drainer, and returning slurry from the in-line drainer
3 to the first conduit.

1 28. A method as recited in claim 27 further comprising pressurizing the liquid from
2 the in-line drainer in a pressurizing device, and passing liquid from the pressurized liquid to
3 the digester.

1 29. A method as recited in claim 28 further comprising passing some liquid directly
2 from the tank to just prior to the pressurizing device.

1 30. A method as recited in claim 28 further comprising passing some of the
2 pressurized liquid from the pressurizing device to the high pressure inlet to or outlet from
3 the high pressure feeder.

1 31. A system for feeding comminuted cellulosic material entrained in liquid to a high
2 pressure feeder connected to a digester, comprising:
3 a vertical treatment vessel having a discharge at the bottom thereof;
4 a metering device connected to the discharge of said treatment vessel;
5 a generally vertical chute extending downwardly from said metering device; a high
6 pressure feeder connected to a digester;
7 a slurry pump which pumps a slurry of comminuted cellulosic material in liquid, said
8 slurry pump having an inlet, said pump connected to said high pressure feeder; and

9 a vessel having a width dimension greater than the width dimension of said chute,
10 positioned concentric with said chute, and having a liquor level therein and an outlet
11 operatively connected to said slurry pump inlet.

1 32. A slurry transport with liquid level control, comprising:
2 a substantially vertical conduit;
3 a tank, having a top and a bottom, surrounding a portion of said conduit and in liquid
4 communication therewith so that the liquid level in said tank controls the liquid level in said
5 conduit; and
6 said liquid communications being provided at least in part by a bottom end of said
7 conduit terminating above said bottom of said tank to provide a vertical gap.

1 33. A slurry transport as recited in claim 32 further comprising a screen or strainer
2 at said vertical gap to minimize the amount of slurried material passing from said conduit to
3 said tank, and wherein said gap is about 3-48 inches.

1 34. A slurry transport as recited in claim 33 wherein said single tank is substantially
2 concentric with said substantially vertical conduit; and wherein said single tank comprises
3 a substantially right cylindrical upper portion and a substantially right circular one frustum
4 lower portion.

1 35. A method of feeding comminuted cellulosic fibrous material to a digester using a
2 high pressure transfer device having a high pressure inlet and outlet, and low pressure
3 inlet and outlet, comprising:
4 a) slurrying the material with liquid prior to feeding the slurry into the low pressure
5 inlet;
6 b) returning liquid and any entrained material from the low pressure outlet to the low
7 pressure inlet in a return system devoid of an in-line drainer and level tank;
8 c) pressurizing the slurry in the high pressure transfer device by pumping high
9 pressure liquid into the high pressure inlet of the transfer device; and
10 d) passing the liquid from the high pressure outlet of the transfer device to the
11 digester.

1 36. A method as recited in claim 35 wherein b) is further practiced using a return
2 system also devoid of a centrifugal separator.

1 37. A method as recited in claim 36 wherein b) is further practiced using a return
2 system also devoid of a surge tank.

1 38. A method as recited in claim 36 further comprising removing tramp material
2 from liquid circulating to or from the high pressure transfer device using a tramp material
3 trap.

1 39. A method as recited in claim 35 wherein a)-d) are practiced without a screen in
2 the low pressure outlet.

1 40. A feed system for a digester, comprising:
2 a high pressure transfer device having a high pressure inlet and outlet, and low
3 pressure inlet and outlet;
4 a slurring device connected to the low pressure inlet which slurries comminuted
5 cellulosic fibrous material with liquid;
6 a high pressure pump for pressurizing liquid being fed to the high pressure inlet;
7 a connection between the high pressure outlet and a digester;
8 a return system for returning liquid from the low pressure outlet to the slurring
9 device; and
10 said return system devoid of an in-line drainer and level tank.

1 41. A system as recited in claim 40 further comprising a pump not adversely
2 affected by the presence of comminuted fibrous material in fluid pumped thereby, said
3 pump connected between said return system and a digester.

1 42. A system as recited in claim 41 wherein said pump comprises a screw pump.

1 43. A system as recited in claim 41 wherein said low pressure outlet is devoid of a
2 screen.

1 44. A system as recited in claim 40 wherein said return system is also devoid of a
2 centrifugal separator.

1 45. A system as recited in claim 44 wherein said return system is also devoid of a
2 surge tank.

1 46. A system as recited in claim 45 further comprising a tramp material trap which
2 removes tramp material from liquid circulating to or from the high pressure feeder.

1 47. A system as recited in claim 40 further comprising a pump between said
2 slurring device and said low pressure inlet.

1 48. A system as recited in claim 47 wherein said slurring device comprises a
2 substantially vertical conduit substantially surrounded by a single tank which performs both
3 the function of controlling the level of liquid and storing and substantially continuously
4 supplying liquid to said pump.